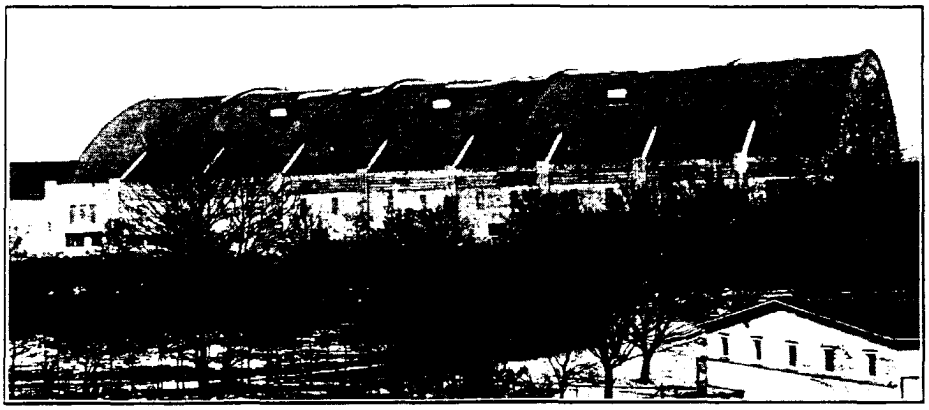
Lead Pads for Huge Arch Roof of Hershey Sports Arena



Sports arena at Hershey, Pa., measuring 245½ x 364 ft. over-all. The stiffening arches for the roof rest on lead pads.

LAST winter the new sports arena at Hershey, Pa., was opened. It is a mammoth structure containing a regulation hockey rink seating 7,200 spectators, and accommodating 10,000 at events requiring less floor space. Over-all dimensions of the building are 245½ ft. by 364 ft.

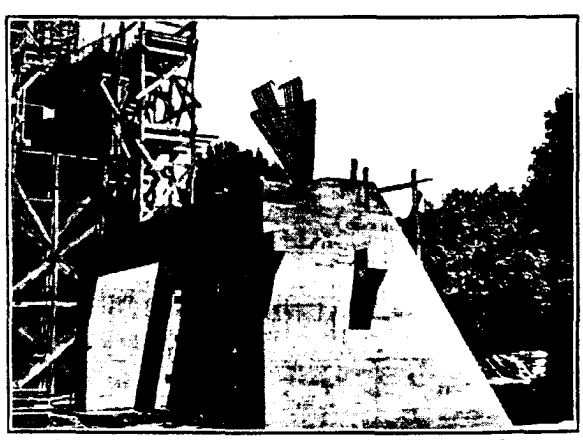
One of the most interesting features of the building is its roof construction. It is a barrel vault concrete roof of the Zeiss-Dywidag type, 232½ ft. by 343 ft. over-all, with a shell only 3½ in. thick. This shell is stiffened at 39 ft. intervals by two-hinged arch ribs that span 222 ft. between hinge centers. The roof crown is 100 ft. above the floor. The shell was constructed in five units with expansion joints between.

Lead performs an important function in the hinges which provide flexibility and allow movement at the base of the arch reinforcing ribs. Hinges are a combination of lead pads and Mesnager hinges. Steel reinforcing bars, 1 in. in diameter, protrude from the piers in a fan shape, intersecting at the center of the joint. A lead pad 3 ft. long and 9 in. wide fits snugly against the bars on each side. These pads are 1 in. thick and are set ⅝ in. into a depression in the pier, leaving ⅜ in. exposed above the concrete on which they rest. A varnish coating was applied to both sides of the lead to prevent any possible corrosion from free lime while the concrete is green. A 2 in. space was then left between the base of the concrete arch and the top of the concrete pier except where the lead pads occur, the arch resting on the lead at that point.

The arches were designed for a maximum reaction of 1,100,000 lb. and maximum rotation at the hinge is 24 minutes under extreme load. In the hinges the lead takes most of the normal pressure and the fan-like bars take the stress due to rotation and prevent motion due to differential thrusts in the direction of the plane of the lead. The 1 in. bars are small enough to take bending stresses without being overstrained.

Special tests made by the engineers showed that there is a more or less definite yield point for lead so long as it is kept uninterruptedly under a pressure that is not materially released. According to the engineers,

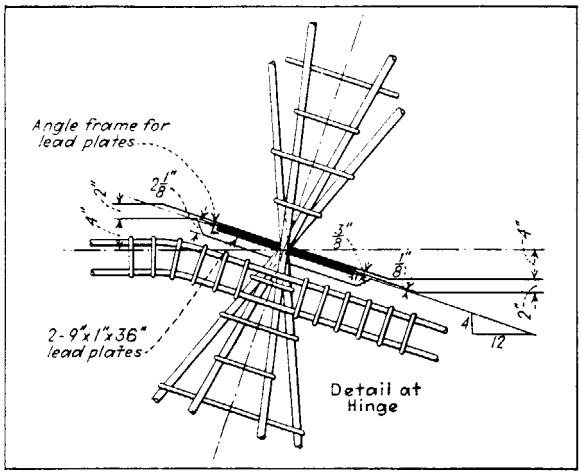
Reinforcing bars forming semi-hinge between arches and footings. The lead pads are placed in the depression shown in the footing.



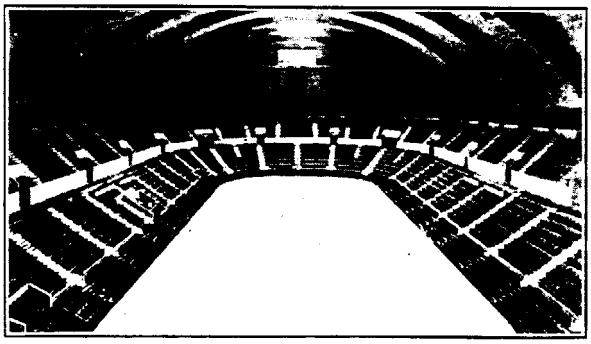
Arch foundation piers on top of which lead pads rest in depression shown in photo at left, with hinge reinforcing bars protruding.

it could be assumed that the lead would exhibit an elastic behavior below an established yield point under the high constant pressure of the dead load of the roof with only slight changes caused by live load. Since it was impossible to make long-time studies of plastic deformation, the lead plates were confined in galvanized angle-iron frames to eliminate any tendency to flow. (In this connection, it is interesting to note that tests carried out several years ago on lead-asbestos anti-vibration pads 1 in. thick containing two $\frac{1}{8}$ in. layers of lead showed virtually no lateral deformation of the pads at maximum load, which was 400,000 lb. per sq. ft., but these tests were likewise short-time.)

Lead pads in this type of hinge are said to permit necessary rotation by yielding slightly when movement occurs, yet maintain an even bearing surface and prevent cracking of the concrete. To make certain that forces between the arch and abutment are transferred only at the hinge and to protect against corrosion, asphalt and cork filling was used in all joints around the bars and lead.



Cross-section through arch hinge, indicating location of lead pads and angle-iron frames.



Interior of the Hershey Sports Arena. Some of the roof stiffening ribs that rest on lead pads at each end are visible.

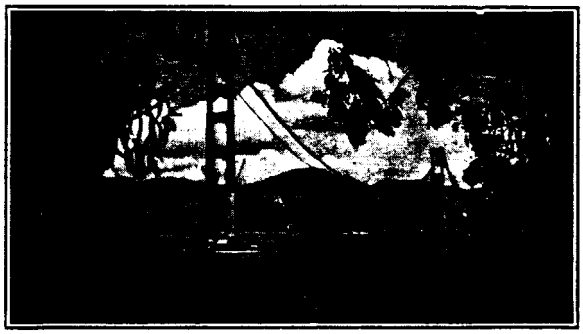
The new arena is one of the fine community projects built by the Hershey interests for the benefit of the residents of the town in which Hershey Chocolate is made. It was designed and constructed by Hershey Lumber Products, of which D. Paul Witmer is general manager. Roberts & Schaefer Co. of Chicago were designing and supervising engineers for the Z-D vaulted roof with Anton Tedesko in direct charge of design and construction. Complete descriptions of the roof construction and methods have been given in *Engineering News-Record*, Apr. 8, 1937; *Construction Methods and Equipment*, Apr. 1937; and *Architectural Concrete*, vol. 3, no. 1.

Brilliant Lead Chromate Paint on Golden Gate Bridge

FOR a definite esthetic reason, the color known as "international airways orange" has been selected for the final coat of paint on San Francisco's huge Golden Gate Bridge. Incidental to its color, but also of great importance, is the fact that this paint is extremely durable under adverse exposure conditions. It is made of basic lead chromate, which is manufactured from the lead monoxide known as litharge, and has a brilliant vermillion color remaining bright and free from fading for a long time.

Since the Golden Gate Bridge is a structure of such magnitude and is so definitely "located" in the landscape, it was felt that a color should be used that would emphasize its size and make it stand out from its surroundings. "International airways orange" accomplishes both these objectives. In foggy weather, gray is the prevailing landscape color and in fair weather it is blue. Against both these colors, the brilliant orange contrasts well and enhances the scale of the structure.

That the color selected for the bridge is the same as that adopted by the nations of the world a year or more ago to be the official color for airway markers is purely



COURTESY STANDARD OIL CO. OF CALIF.

Magnificent Golden Gate Bridge at San Francisco, painted with a finish coat of "international airways orange" made from basic lead chromate.

a coincidence. In the latter case, its adoption was because of its high visibility.

In the future "international airways orange" will probably find much more extended fields of usefulness now that the builders of the Golden Gate Bridge have recognized its value and employed it on a large scale. Since it is durable, attractive and highly visible, it will be found appropriate for many uses other than airway markers.

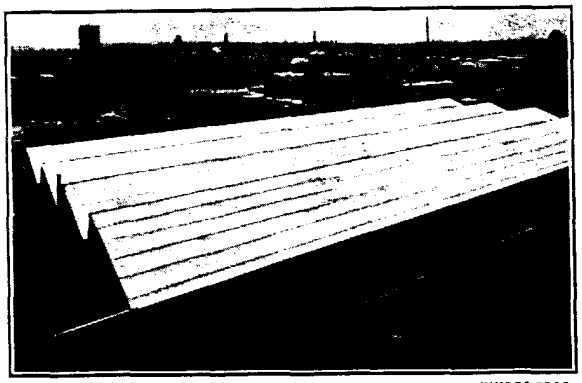
Joseph B. Strauss is chief engineer for the Golden Gate Bridge and Irving F. Morrow its architect. A description of the bridge and red lead priming coats was contained in LEAD for November, 1936. It was after seeing the structure primed with red lead that the appropriateness of the brilliant color was realized, for "international airways orange" is quite similar to red lead in color.

Lead Makes Excellent Flashing for Corrugated Transite

LEAD flashing and gutters were used on the new warehouse of Jones & Laughlin Steel Service, Inc., in Long Island City, N. Y., in conjunction with corrugated transite roofing and siding. This Company merchandises a complete line of steel products manufactured by Jones & Laughlin. Lead flashing was chosen as the best possible medium of protection against wind and weather as well as heat loss. Gable ends of the saw tooth roofs, cap flashings in the saw tooth roof valleys, and window head, jamb and sill flashings were all 4 lb. soft lead and the gutters were 4 lb. hard lead.

All lead flashing was installed in short pieces, overlapped and unsoldered, so that expansion and contraction was minimized and confined to each individual piece of flashing. Where necessary, lead-headed bolts were employed as they require no puttying to make the bolt holes water-tight since the lead heads take care of this.

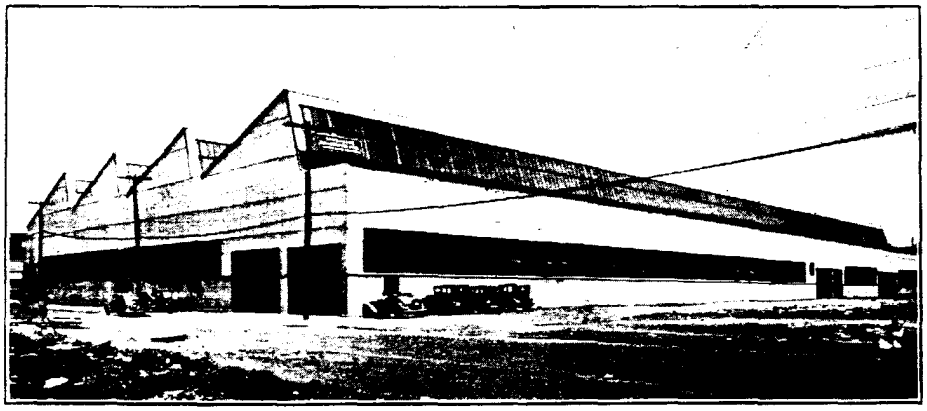
The accompanying drawings show how the lead was installed. It will be noted that the flashing had to be formed to fit into the corrugations of the roofing and siding. The designers used an economical and interesting method to accomplish this. Practically all the flashing was shopformed by stamping to fit the corrugations. Formed lead is the finest solution of the problem of a corrugated sloping surface joined to a flat vertical surface. The valuable steel housed in the heated bays could be insured in no other manner.



WURTS BROS.

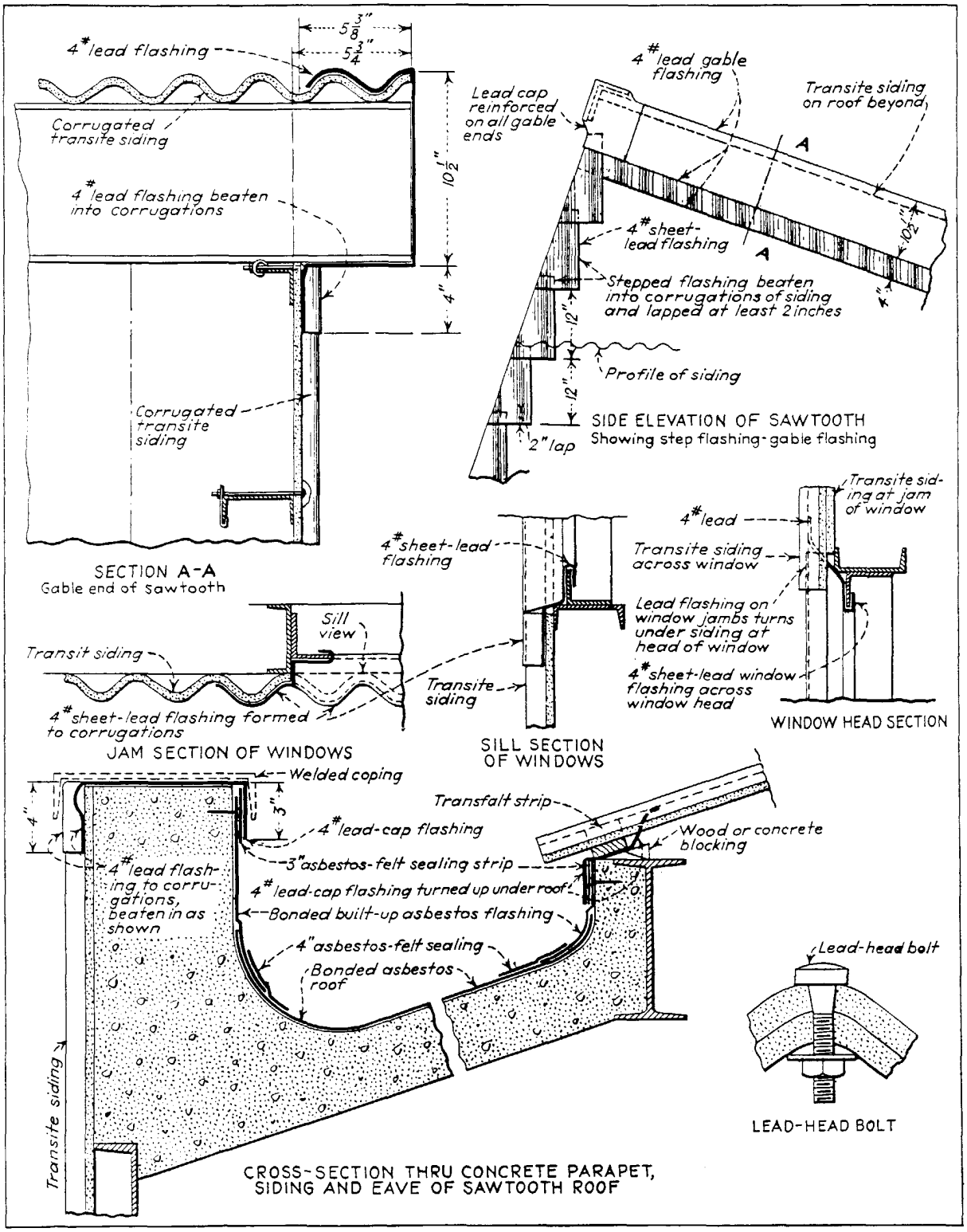
Roof of Jones & Laughlin Steel Service, Inc., warehouse, giving an idea of the large quantity of lead flashing required with this type of construction.

Lead has numerous advantages for flashing corrugated transite roofing and siding. Because it is soft, it is easily formed, either by hand or by stamping, to fit snugly into the corrugations, thus making an appreciable saving in installation cost. The snug fit of lead in the corrugations permits making the building wind as well as water-tight, an essential if the building is to be heated as this one is. Lead is the most durable common metal when exposed to the atmosphere. Since transite is most frequently used in industrial areas, as

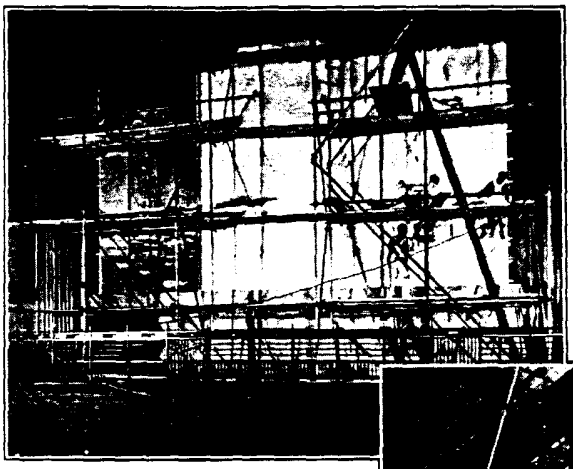


WURTS BROS.

Warehouse of Jones & Laughlin Steel Service, Inc., Long Island City, N. Y. Lead gable end, window and cap flashing may be seen in the cover photo. Gutters are also lead.



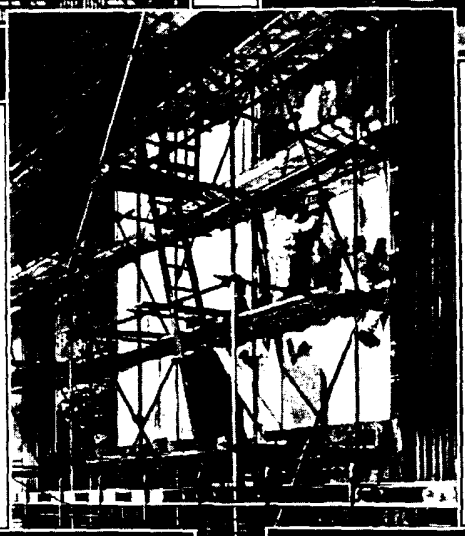
Typical sections through some of the various kinds of lead flashing used with corrugated transite roofing and siding on Jones & Laughlin Steel Service, Inc., warehouse.



PHOTOS BY WURTS BROS.

Applying white lead-varnish mixture to primed wall prior to hanging mural in the Drydock Savings Institution, New York.

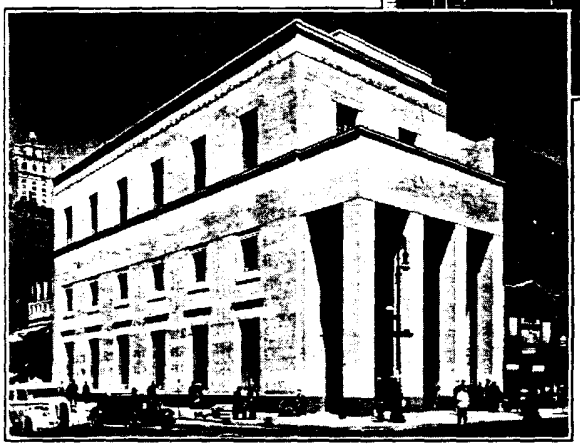
Board room, Drydock Savings Institution, decorated with pure white lead, stippled.



New building for Drydock Savings Institution, New York. Louis Weeks and Cross & Cross, architects.

Rolling the mural flat over the white lead-varnish mixture previously applied.

The finished mural, painted by Griffith Bailey Coale, hung on white lead-varnish mixture in main banking room.



in this case, lead's great resistance to attack by industrial fumes found in the atmosphere is of particular importance. Furthermore, lead offers about twice the thickness of metal usually obtained in flashing, which adds proportionately to the life of the flashing. Appearance is another advantage, for lead's color blends well with that of transite and lead does not stain.

The gutters, which are 10 in. wide at the bottom, are 4 lb. hard lead. Longitudinal angle irons support the base of the gutter and the lead was wrapped around a flat iron bar to form a stiffening bead at the front. Expansion joints were provided at all high points.

The building was designed by A. W. Barbour and William H. Higbie, Jones & Laughlin engineers. Johns-Manville Corp., which recommends lead flashing with its transite, supplied the transite roofing and siding, and John Schneider Roofing Contractors, Inc., of Brooklyn, N. Y., installed the transite and lead work.

White Lead Hangs Mural and Decorates Bank Interior

IN the main banking room of the new Dry Dock Savings Institution Building in New York City, designed by Louis Weeks, and Cross & Cross, architects, the central decorative feature is a beautiful mural measuring 20 ft. by 30 ft. It depicts a packet ship of the period of 1848 coming safely into the protecting harbor from a stormy sea and is called "Safe Haven". Painted by Griffith Baily Coale, well known New York artist, this arresting mural represents the safe haven provided by the bank, which was founded in 1848. It lends a distinguished and unusual air to the banking quarters.

Unseen, lead helps to make this a beautiful decorative feature. To hang this heavy canvas, a strong, durable adhesive was necessary. For that purpose, 400 lb. of paste white lead was mixed with 4 gal. of high grade varnish. This mixture was brushed onto the wall and the canvas applied and carefully rolled smooth. This operation was done by the decorators, Mack, Jenney and Tyler, of New York, who have had much experience in hanging fine murals. They use the white lead-varnish mixture for this purpose exclusively.

Although the main banking room is paneled with wood, many of the other rooms, including the directors' room, officers' quarters, clerical department and employees' rest room, are plastered. They are painted with pure white lead and given a stippled finish, a treatment that provides a beautiful, durable and washable wall treatment. White lead is the favorite of leading decorators for the finest interior paint finishes.

The mixing formulas appearing in LEAD, January, 1937, can be recommended for pure white lead paint on interior plaster.

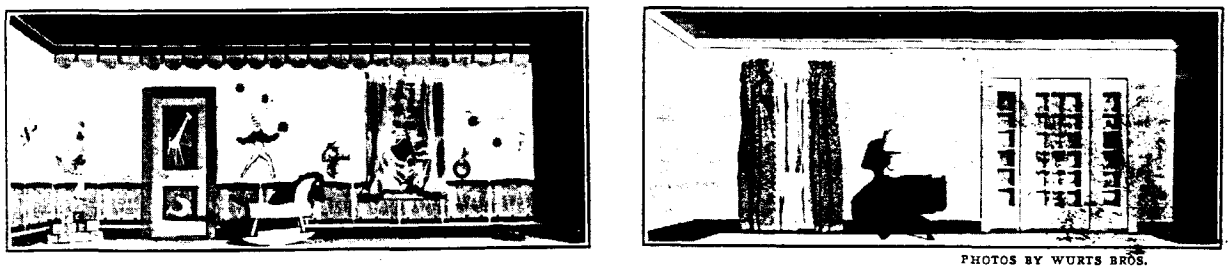
A Unique Traveling Lumber and Paint Display

TO extend its program more rapidly and thoroughly to local lumber dealers throughout the country, the Lumber Products—Better Paint Campaign has added a new traveling field office and display to the one it employed last year. Presented to the Campaign by the Douglas Fir Plywood Association, the new office is a trailer coach specially constructed for its purpose. It is built of waterproof Douglas Fir Plywood on the outside and regular Douglas Fir Plywood inside.

Traveling field office and display of the Lumber Products—Better Paint Campaign, presented by Douglas Fir Plywood Association, in front of U. S. Forest Products Laboratory, Madison, Wis.

This program is designed to educate lumber dealers to the importance of pure white lead or the highest quality prepared paint as an aid in promoting lumber markets. The educational displays carried by the coach are exhibited to the public as well as lumber dealers in order to stimulate the public desire to build with lumber and beautify with good paint. Among the most interesting of the display materials are exact scale model house exteriors and interiors less than 20 in. long, built from actual house plans. They demonstrate the beautiful effects that may be obtained by the use of lumber products and good paint, and show how these materials can be combined to produce different and refreshing effects in both modern and traditional treatments. One of the great advantages of building with lumber is that, by the use of paint, it may always be kept new and fresh looking and new effects or decorative treatments applied to existing buildings at little expense.

Other exhibits, prepared by the U. S. Forest Products Laboratory, show how a tree grows, the cellular struc-



PHOTOS BY WURTS BROS.

Two of the model interiors, about 18 in. wide, displayed by the Lumber Products—Better Paint Campaign to show the possibilities of decoration with paint.

WURTS BROS.

One of the exterior models, about 18 in. wide, showing the wonderfully attractive appearances possible through the use of lumber and paint.

ture of wood, how a log is sliced into lumber and how to construct walls to prevent moisture condensation damaging to paint films. Paint pigments and their opacity are also displayed, and at meetings conducted on the coach's tour, discussions of painting and decorating possibilities and problems are held.

The Lumber Products—Better Paint Campaign is sponsored by the Lead Industries Association as a contribution to the lumber industry to increase lumber markets through the use of better paint. Lumber manufacturers' and wood working associations, plywood manufacturers, lumber dealers', wholesalers' and salesmen's associations, the Painting and Decorating Contractors of America and the National Paint, Varnish and Lacquer Association, are cooperating in the Campaign.

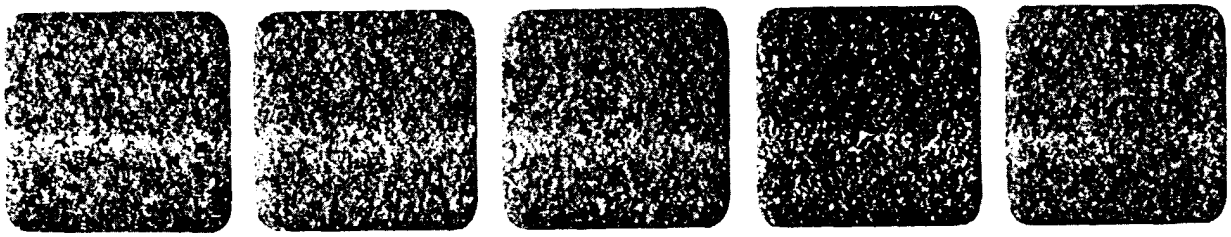
Stone Surfaces Perfectly Imitated by Use of White Lead

WHITE LEAD has a multitude of interesting painting applications. A striking new example of white lead's versatility is afforded by the Oceanic Building at 2 Pine Street, San Francisco, Cal., as shown by the accompanying photograph. The upper six floors and penthouse of this structure are of concrete construction. The first floor and mezzanine are faced with granite. About two and a half years ago, the upper six floors were painted with three coats of white lead and linseed oil. Immediately after the application of the last lead coat, before drying, a mixture of granite aggregates was applied under pressure by a spray gun. The resultant effect is a close approximation of the real thing. It provides an extremely durable surface and at a short distance away it is impossible to distinguish the job from natural granite. An illustration reproduced here shows some of the interesting stone textures obtainable by the use of this method. Practically any type of fine grained stone construction can be imitated.

In addition to the building above described, several other structures in and around San Francisco have been finished in the manner indicated, as well as the Bank of America branches in Eureka, Crescent City and Exeter, Cal.

The originator and applicator of this system of painting is J. Z. Smith, San Francisco, Cal.

Oceanic Building, San Francisco. The concrete upper stories are made to imitate the two granite lower stories by the use of white lead and granite aggregate.



Five stone textures obtained by the use of white lead and appropriate stone aggregates.

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